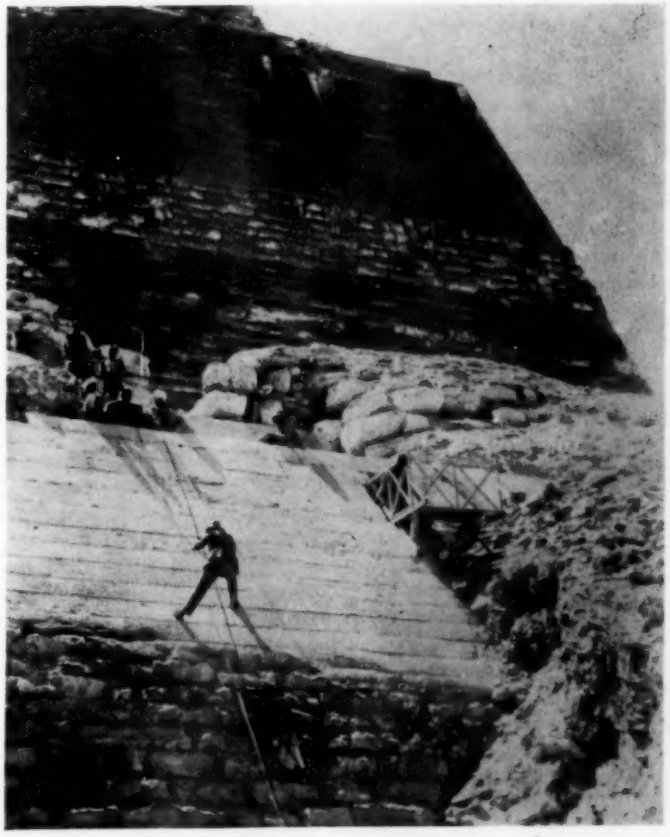
SCIENCE NEWS-LETTER

The Weekly Summary of Current Science

A SCIENCE SERVICE PUBLICATION

$5 a Year 15c a Copy May 31, 1930



MEASURING A PHARAOH'S TOMB

Archaeologist Climbs Meydum Pyramid "Human Fly" Fashion

(See page 342)

Vol. XVII No. 477

Autos Should Be Seen and Not Heard

Automotive Engineering

THE birdies that sing in a car, "Squeak! Squeak!" are so irritating to the majority of drivers and passengers as to suggest that radical changes in automobile body and chassis construction are needed. This possibility for improving automobile riding comfort was brought strikingly to the attention of the Society of Automotive Engineers at their 25th anniversary meeting in a report by Prof. G. C. Brandenburg and Prof. Ammon Swope, of Purdue University.

These two professors are engaged now in an investigation of riding comfort. They reported that they have started out by asking 125 young men and women to rate their feelings on a variety of automobile riding qualities which might involve discomfort.

Body noises were particularly denounced by the raters. Their verdict throughout the list of possible automobile annoyances, emphasized the feeling that an automobile should be seen and not heard. Squealing brakes, the roar of a car, noise from wind, tire noises, and those baffling unidentified sounds that haunt a car were all termed objectionable by a large percentage of the raters.

"The comfortable qualities in riding are often mental," the report stated. "Fatigue may be due to these mental qualities as well as bodily discomfort."

The sensation of riding up and down as you advance is uncomfortable to about one person in three. A good many of the raters said that swaying motion was nauseating to them. Women are more sensitive to this trait in a car than are men, the report indicates.

The great majority of the men said they preferred to do their own driving. Almost fifty per cent. of the women, on the other hand, felt most comfortable in a car when some one else held the wheel.

The speed most enjoyed in road travel was given as 42 miles an hour average, and there was no significant difference between men and women on this point.

AN electro-magnetic automobile brake that enables drivers to stop speeding passenger cars and heavily loaded trucks by the mere throwing of a switch was described by John Whyte, of Beloit, Wis.

The brake operates on a car's storage battery. The switch is connected to the foot pedal, so that the driver performs the same operations he would with a mechanical brake but at the cost of practically no effort. Wires instead of rods run to the brakes on each wheel. Their action was said to be uniform at all times and adjustment for wear unnecessary.

THE most universal substance in the world, unseen at all times and unfelt except when the wind blows, is keeping automobiles from running faster.

When cars travel above 40 miles per hour more power is required to overcome air resistance than road resistance, Prof. Felix W. Pawlowski, of the University of Michigan, pointed out.

"At a speed of 50 miles per hour the wind resistance of the usual motor car is between 110 and 170 pounds," said Prof. Pawlowski, "absorbing between 15 and 23 horsepower of the engine out-put. At 100 miles per hour these figures would be quadrupled."

Besides increasing speed, streamlining automobiles would have the advantage of not stirring up dust clouds on gravel roads. These dust clouds visualize very well the character and size of eddies produced by cars.

AUTOMOBILES having no ignition system and averaging 25 miles on a gallon of six cent crude oil are not far distant. A Diesel engine which accomplished these economies was recently operated successfully in a seven-passenger sedan and a roadster, C. L. Cummins, of Columbus, Ind., reported.

The widespread use of the engine depends on additional technical perfection, experts say, which should be accomplished through scientific research during the next few years. In Europe where the cost of gasoline is very high, the Diesel engine is already being applied to trucks and motor buses.

Mr. Cummins announced plans to put such an engine on the market in America. It will compare favorably with present day standard gasoline engines in truck and bus service, he said, and should carry the Diesel engine into the automotive field very fast.

The engine used in the sedan and roadster was designed primarily for marine service, but after being adapted to the automobiles it performed unusually well. During the entire 6,000 miles the sedan was driven, its performance was practically the same as with the standard equipment originally used. The only noticeable difference was a little sluggishness in the pick-up from zero to 20 miles per hour. Top speed was 55 miles per hour.

The same engine in the lighter car made a speed of 88 miles per hour and acceleration was better. It took four passengers up Lookout Mountain at Chattanooga in high, except over two rough spots.

In spite of this excellent performance much development must be accomplished before the Diesel will be suitable for use (*Turn to page* 350)

The Answer Is

In This Issue

What *annoys* motorists? p. 338—How does one *travel* in the Madagascar *desert?* p. 339—Is your *ring* finger longer than your *index* finger? p. 341—Are many men *trained* for *hygienic* research? p. 342—What is an *aero* speed boat? p. 342—What characteristic of *X-Rays* makes them most useful? p. 343—How many *symptoms* are there of mental disorder? p. 343—Does *long life* run in families? p. 345—What is beta-chloroethyl-2-furfuryl-sulfide? p. 348—What *instrument* makes it possible to see plants grow? p. 349.

SCIENCE NEWS-LETTER, The Weekly Summary of Current Science. Published by Science Service, Inc., the Institution for the Popularization of Science organized under the auspices of the National Academy of Sciences, the National Research Council and the American Association for the Advancement of Science.

Edited by Watson Davis.

Publication Office, 1918 Harford Ave., Baltimore, Md. Editorial and Executive Office, 21st and B Sts., N. W., Washington, D. C. Address all communications to Washington, D. C. Cable address: Scienserve, Washington.

Entered as second class matter October 1, 1926, at the postoffice at Baltimore, Md., under the act of March 3, 1879. Established in mimeographed form March 13, 1922. Title registered as trade-mark, U. S. Patent Office.

Subscription rate—$5.00 a year postpaid. 15 cents a copy. Ten or more copies to same address, 5 cents a copy. Special reduced subscription rates are available to members of the American Association for the Advancement of Science.

In requesting change of address, please give old as well as new address.

Advertising rates furnished on application.

The largest intisy tree left alive. Before Madagascar's "rubber rush" of the nineties, there were great numbers of them that were half again as high.

Rare Intisy Rubber Tree

May Beat Edison's Goldenrod

By Frank Thone

WHEN Edison started his quest for a rubber-yielding plant that could be grown in the United States, his world-combing fingers reached, among other places, Madagascar. Like all tropical lands, this great island off the eastern coast of Africa has a number of rubber plants in its strange and fantastic flora, and one of these, a vine belonging to the milkweed family, came home to Mr. Edison's Florida farm for a try-out. Although this experiment started several years ago, before the now famous goldenrod plantation scheme was undertaken, no anouncement has so far been made of its outcome. Presumably the plants are still under cultivation, but have not yet shown such promise as to justify the great inventor in ceasing his search.

But the American consuls, Ford agents, and other volunteers who helped Edison in his search completely missed a much better rubber plant in Madagascar than the one which they sent home, and it has remained for a young man in the U. S. Department of Agriculture, Dr. Charles F. Swingle, to score a much greater success than they.

As a result of a two-man expedition to southern Madagascar, in which a French scientist, Prof. Henri Humbert of the University of Algiers, was the other participant, he has brought back to America living specimens of a tree so rich in rubber that strips of the pure gum can be pulled out of cuts made through its bark a few hours before. His young trees are now growing in the greenhouses of the Department of Agriculture in Washington, and a few of them on experimental grounds in Florida, Arizona and southern California.

The tree is not naturally a fast grower, so that it will be several years before it is known definitely how much can be expected of it in this country. But its record in its native land is most excellent. Too good, in fact; its discovery in 1891 caused a veritable "rubber rush," and almost brought about the extinction of the species through reckless exploitation by the whites and the crude gathering methods employed by the natives. Even before the botanists had got round to giving it a scientific name, the plant had become so great a rarity that when Dr. Swingle and his French colleague sought it a generation later they had great trouble in locating it, though they knew exactly what they were hunting for and at least approximately where to seek it.

The tree had been known to science for nearly forty years, and dried specimens of it were in at least a few of the leading European museums.

But they did not know whether the merciless collecting methods of the "rubber rush" that took hold of Madagascar in the nineties had left any of the trees alive in what had once been their native wilds. Reports were conflicting, and some botanists were quite convinced that the species was as dead as the dodo. In fact, Dr. Humbert, the recognized authority on the plants of Madagascar, had previously made two trips to the island without seeing a single living specimen.

When Dr. Swingle joined his French colleague at Marseilles he found the situation somewhat comically complicated at the outset. Prof. Humbert, he discovered, did not speak English, and his own French was exceedingly limited. However, by piecing out their vocabularies with German and Spanish and an occasional scrap of Latin they got along. After they arrived in Madagascar they both learned a little of the native Malagash language, and that helped a good deal, especially in identifying plants.

Their voyage, via the Suez canal, the Red Sea, and along the east coast of Africa through the Indian ocean, was of routine variety, Dr. Swingle says. But at Majunga, the port on the northwest coast where they landed, they just missed the

How intisy rubber was marketed. Natives pulled bands of pure rubber from cuts they made in the tree, and wranped them into lumps as big as baseballs. This ball of rubber strings will bounce as well as a child's play ball.

small steamer for Tuléar, the town near the southern end of the island that was to be their base. And there wasn't another boat for six weeks.

So they had to change their plans and proceed overland. The first three days were uncomfortable ones, on small, crowded river boats pushing precariously through waters infested with crocodiles. Then they came to the terminus of one of the excellent roads which the French have strung through the island, and made the rest of the trip to Tuléar by motor-bus, private automobile and narrow-gauge railway.

Arrived at Tuléar, they considered ways and means of getting into the brush where the treasure they hoped for might be growing. They hired the one motor truck available to get them to a small village at the edge of the desert. Here they assembled their forces of porters, whose loyalty was assured in part by a promise from the local magistrate of two weeks in jail for any man who deserted. A company of 38 was needed to carry the needed supplies of water, food, equipment and Dr. Swingle and Prof. Humbert.

For in the Madagascar desert, as in many other places in the tropics, white men do not walk. It is not so much a matter of prestige as of necessity; you simply cannot do a day's march and be in shape for going on again the next day. So Dr. Swingle and his companion were borne in the Malagash version of the palanquin of the Cæsars—a not-too-easy-riding litter known as a "filanzana." It was neither comfortable nor dignified, but it did save strength for botanizing, which is a strenuous enough job in the tangled, thorny scrub where the intisy bushes are to be sought.

Once, three days' march from the last water-hole, the last mouthful of water was gone, and the party found itself in a rather tight place. However, they knew they couldn't get back, and so kept on forward. Five of the porters collapsed. Things looked bad.

Explorer-botanist Charles F. Swingle examines one of his precious rubber plants from Madagascar, in the greenhouses of the U. S. Department of Agriculture at Washington, D. C.

Then they sighted a small native village, whence they were guided to a water-hole. The water was not greatly superior to that supplied by Gunga Din, but it served, and presently all hands recovered and were able to push on.

But, though they were in a botanists' paradise and had found a wealth of interesting plants, still they had not found the tree they particularly sought. The golden fleece of this expedition was apparently as elusive as that sought by the legendary Greeks under Jason.

At last, on the sixteenth day of the uncomfortable, thirst-tortured filanzana travel, they found it. The plant, potentially of small tree size, exists now mostly as mere bushes, for the species has not yet recovered from the scourging it received over a generation ago. However, the assurance that it still exists, and that he could have all the specimens he could carry with him, made Dr. Swingle forget the toil and difficulties he had been through. The long journey, nearly halfway round the world, was a success.

The bushes grew in a soil so rocky and dry that it took the hardest kind of labor to dig up the roots he wanted. The native porters, who could pack a heavy load all day, knew little about digging, and only by offering more than triple pay was Dr. Swingle able to hold them to the job. After he had obtained a good supply of living plants and a quantity of the remarkable storage roots, he called the job done and as soon as possible prepared for his journey homeward, carefully guarding from the rigors of the long voyage the uncouth bundles he had sweated—and almost bled—to obtain.

This great prize of Dr. Swingle's expedition belongs to the plant family of the euphorbias, widespread in tropic and temperate lands in both hemispheres. Many ornamental and economic plants already well known are euphorbias. The poinsettia we use at Christmas is known to botanists as *Euphorbia pulcherrima*, which means "very beautiful euphorbia." The familiar castor bean of our backyard gardens is a member of the family. And more important still is another relative, *Hevea brasiliensis*, the South American tree that now produces, in its new home in the East Indies, nine-tenths of the world's rubber.

The Madagascar tree is known botanically as *Euphorbia intisy*. The "intisy" part is one of the names by which it is known among the natives; the rubber which it used to produce in commercial quantities was also known as "intisy," and the tangled growth of mixed varieties of peculiar desert bushes where the plant still survives is called the "intisy brush."

In the prime of the old intisy brush, the biggest trees reached a height of about twenty feet, according to reports. The largest specimen now surviving is only about two-thirds that size, and it has survived only because it grew in a sort of botanical garden, now neglected and semi-abandoned. The tree, like many plants that grow in deserts, has no leaves. Or rather, it forms small, narrow leaves that drop off almost at once, leaving the (*Turn to page* 350)

The water-jug roots of the intisy tree enable it to survive in a desert as dry as anything we have in Arizona or Nevada.

Energy As Universe's Fifth Dimension

General Science

Royal Society of Canada Receives Research Reports

MONEY as an expression of the energy it will buy was suggested as a kind of fifth dimension of the universe by Prof. A. S. Eve of McGill University in his presidential address to the Royal Society of Canada at Montreal.

A new theory of the universe was briefly suggested by Dr. Eve when he explained that energy has an intimate relation with time and frequency or wave-length, now so familiar in radio. Just as Einstein explained gravitation on a geometrical basis, so Dr. Eve believes it may be possible to "consider energy more fully as an aspect of frequency, possibly arriving at a comprehensive wave theory of the universe."

"If I go to California," the McGill physicist explained to the leaders in Canadian science, "I must expend time to cover space; nor is my journey direct, but to the right or left, and up and down, added to the actual distance, so that we have three degrees or types of space linked to one of time, and Minkowski brilliantly showed us how inevitably these were united in the four-fold union of space-time.

"It has always seemed to me that even in this four dimensional union something is still lacking. In order to go to California I must have money, an important fifth degree of freedom. It is well known, however, that money is merely the opportunity to acquire what we think that we need, and on a journey money buys energy, so requisite for the traveler's life and movement, and no less essential to the army of workers who today assist him on his journey whether by direct or mechanical means. A bird can obtain its energy directly from food, and requires no money for sustenance, clothes or transportation. The fifth degree of freedom is, therefore, energy, and a large part of it we derive from breathing air, the only thing still free to all, without taxation or payment."

A QUARTZ crystal that measures pressures in an airplane engine with great accuracy and speed was exhibited to the Royal Society of Canada by H. G. I. Watson of McGill University. When the crystal is squeezed an electrical current is generated within it and this current can be made to write the story of the pressure changes. Thus there is added another use to the practical applications of piezoelectric crystals which now regulate the frequency of radio stations, control accurate clocks and perform other scientific tasks.

IF you are a man the chances are that your ring finger is longer than your index finger. If you are a woman the chances are that your ring finger is shorter than your index finger. This is an interesting anatomical fact discovered by Dr. R. K. George of the University of Toronto and reported to the Royal Society of Canada. This state of affairs held for both right and left hands in most of 620 white adults that Dr. George studied.

THE mystery of feminine sex was lessened somewhat when Dr. J. B. Collip of McGill University, one of the group of Canadian scientists who gave insulin to the world, told the Royal Society of Canada details of his researches upon a hormone or powerful chemical substance that causes precocious maturity in young, immature and virgin animals.

Dr. Collip explained that the hormone is obtained from the placenta of animals, a portion of the reproductive system, and he gave credit to a Japanese scientist, Hirose, who nearly a decade ago found the first indication of the presence of this essential sex substance in the animal organism. Dr. B. P. Weisner of Edinburgh undertook the problem and his work formed the starting point of the McGill researches. Dr. Collip and his coworkers have progressed in their investigations so far that they have called the placental hormone by the name "Emmenin."

From the tests made on rats and mice, Dr. Collip discovered that the hormone is involved in the maintenance of pregnancy and he has been led to suggest that the placenta is a ductless gland of pregnancy, just as the pancreas is concerned in the disease of diabetes and the thyroid controls the rate of burning of food within the body.

Dr. Collip's new r searches considered in connection with other researches on sex by Americans, Europeans and scientists of other nations demonstrate that the problem of sex is much more complex than previously realized. At least two and probably more than two hormones are involved in the complex functions that surround the sexual activity of the female. Dr. Collip's hormone is different from another feminine sex hormone recently crystallized by American and German investigators.

Emmenin has no effect on senile animals so that if offers no hope of rejuvenation. Neither does it have any effect on male animals which have hormones peculiar to their own sex.

In ten clinics in Canada and the United States, Dr. Collip's hormone preparation is now being tested experimentally upon human patients suffering from sexual disorders. It is hoped that some unhappy conditions will be corrected by the treatment. At the present time, however, the hormone is not available for general medical use.

RADIO is about to come to the aid of medicine by supplying a new tool for the treatment of disease. Out of the physics laboratory of the University of Toronto, Prof. J. C. McLennan brought to the Royal Society of Canada new information on the relation between the heat generated in the animal body and the frequency or wavelength of current that produces the heating.

Intense high frequency currents similar to those produced in short wave radio sets used to transmit messages to distant parts of the world have been known previously to produce a fever in animals and human beings or a warming of inorganic chemical solutions.

In fact, the dreaded disease paresis, formerly a hopeless sort of paralysis, has been treated successfully by the use of high frequency currents that by producing a fever in the blood kill the harmful spirochetes that produce the disease. The bad paresis germs are sometimes subdued by giving the patient a case of malaria. Malarial fever supplies the curative heat and after the spirochetes are (*Turn to page* 351)

New Research Center for Washington

Plant Physiology

Public Health Work Receives Great Impetus

DEVELOPMENT of a new and very large research center is foreseen as the result of the absorption of the old hygienic laboratory of the U. S. Public Health Service into the new National Institute of Health. The bill creating the new institute has just been passed by Congress and the process of absorption will immediately begin.

The bill carried with it an appropriation of $750,000 which will be used for new buildings and possibly for acquiring sites for buildings. One extra story on the present hygienic laboratory building is planned, with a building for storage and more space for animals. After the original appropriation has been used, further development will depend largely on donations and contributions by private individuals, which the Secretary of the Treasury is authorized to accept on behalf of the government.

The bill provides for the establishment of fellowships so that individual scientists may work at the new institute and contribute the benefits of their research work to the United States. This will increase the research staff of the present force at the laboratory. The Surgeon General of the U. S. Public Health Service will be in charge of the new institute, and Dr. George W. McCoy, present director of the hygienic laboratory, will probably continue as its director.

The process of building up a large research institute will be a gradual one because of the difficulty of securing men adequately trained for the work, Dr. A. M. Stimson, director of the scientific division of the U. S. Public Health Service, stated. At present there is rather a small supply of such men in the country. The institute will probably be a big influence in the training of such personnel, though it is not expected to give such training directly except in special fields of advanced work.

In addition to the fellowships for research at the institute, men on the institute's staff may be sent to institutions here or abroad for special training, Dr. Stimson pointed out.

No definite program of the research problems to be undertaken at the new institute has been formulated. There are many such problems which the U. S. Public Health Service has not yet been able to tackle with present facilities and it is hoped that the creation of the new institute will make it possible to take these up shortly.

Science News-Letter, May 31, 1930

Important Flying Season Planned

Aviation

THE introduction given the 1930 summer flying season by the trans-Atlantic flight of the French aviator Mermoz from Africa to Brazil early this month, and the present three-leg journey of the Graf Zeppelin into two hemispheres bring attention to plans for many other flights in all parts of the world.

Daring aviators still seek Lindberghian fame in spectacular hops such as crossing the Pacific or winging the Atlantic from Europe to America. But popular attention during the coming months is likely to be focused largely on the fuller development by giant craft of routes that have already been explored.

Even now the accomplished Graf Zeppelin is taking 64 persons 18,000 miles into three continents and for the first time it has gone south of the equator. The larger British R-100 and R-101 are scheduled to set out later. They are expected to go to different parts of the world, drawing the first strings to tie the British Empire together by air and to cut distances requiring weeks down to air jumps measured conveniently in hours. The R-100 will visit Canada while her sister ship will call in South Africa, Egypt and India.

The most remarkable heavier-than-air craft planning epochal voyages and one whose useful load compares favorably with the mighty airships is the Dornier DO-X, the largest airplane in the world. Last year it carried 169 persons for an hour over Lake Constance. A hundred people will give way to additional fuel on the coming trip, and the long crossing to New York is to be made in four jumps, with stops at Barcelona, the Azores and Bermuda. American motors are expected to increase the power of the craft 50 per cent, to 7,200 horse-power, and to raise the cruising speed from 115 to 125 miles per hour.

A crossing of the Atlantic on the surface of the water much speedier than any now possible by ocean liner is promised by Paul Dudley's aero speed boat, a hybrid between an airplane and a motor boat. Having wings 48 feet long and a cabin 40 by nine feet, and powered by two 450 horse-power Liberty motors, it will probably carry a score of people skimming over the water at flying speed.

Chief among the adventures with small craft whose flights seem imminent are Dieudonne Coste, of France, who has flown nearly 5,000 miles into Siberia, and Charles Kingsford-Smith, the Australian of Southern Cross fame. They will doubtless seek for their countries the first dashing non-stop crossing of the Atlantic from a famous European air terminal to one in America.

Daring men who would tie more closely the girdle of air communication around the world during the coming months are found in almost every nation. Even if many plans fall through, the summer of 1930 promises to remain epochal in aviation history.

Science News-Letter, May 31, 1930

A Pharaoh's Tomb

THE picture on the cover of this week's SCIENCE NEWS-LETTER shows how an archaeologist masters the "human fly" trick when he must measure the stones that form the sloping walls of a pharaoh's tomb. The scene is the famous pyramid at Meydum, Egypt, supposedly built by King Snefru. The Museum of the University of Pennsylvania is probing the pyramid's secrets.

Archaeology

Science News-Letter, May 31, 1930

X-Rays Reveal Arrangement of Atoms

Physics

Called Most Important Tool of Physics

BECAUSE X-rays do not bend when they hit a solid object, but either pass straight through or stop dead, they have become one of the most important of the tools of modern physics, laying bare the secrets of crystals and showing how atoms are arranged in molecules.

The usefulness of these invisible radiations was discussed in a radio talk by Sir William H. Bragg, director of the Royal Institution of Great Britain and one of the world's leading physicists. He was honored a few days ago by the presentation of the Franklin Medal of the Franklin Institute in Philadelphia. The talk was given over the Columbia Broadcasting System, under the auspices of Science Service.

Radio waves, light waves and the waves of X-rays, Sir William reminded his hearers, are all members of the same family, so far as their fundamental nature is concerned. But radio waves will turn and bend and go around obstacles, while light and X-ray waves will not deviate from a straight line.

"Light waves would be of no use if they behaved like that," he continued. "If they did we should swim in a sea of light but it would be much the same in all directions. Whichever way we looked we should be receiving light from all the surrounding objects: we should have to exercise care even to sort out whether a thing was in front of us

Sir William Bragg

or behind. We must have light that turns corners as little as possible. Even in radio transmission when a so-called "beam" is wanted—a ray which will keep more or less straight without spreading—short waves of twenty or thirty meters only are employed. Now small details can only be kept distinct when the rays of light from them keep very straight. For this reason there is a limit to the smallness of things that may be seen by the aid of ordinary light; not even with the aid of the microscope can that limit be overstepped. In the same way it might be possible to detect the presence of a mountain by its effect on radio transmission; but radio could not be used to find a house or a tree.

"But the X-rays enable us to see, if I may use the word, what light cannot show us. Of course, we have to replace our eyes by specially made instruments. And when we use the X-rays we find ourselves in a new world which is always about us, which has to do with the structures of ourselves and all our surroundings, and with the way in which those structures are fitted for their work; this new world has hitherto been hidden from us.

"First of all, we are struck with the constant tendency in Nature to arrange in order the atoms of which all things are made. The carbon atoms which make up the diamond are arranged in a beautifully simple pattern, one of the most regular of all the patterns we find in crystals; and no doubt we have here the reason why the diamond is so hard. When it is rubbed against other substances in which the forces that tie the atoms together are less strongly and systematically combined, it is the atoms of the second substance that must shift, while the diamond remains unchanged.

"With the aid of the X-rays we can peer down into the pattern of the ice crystal, so fine in detail as to be far beyond the power of light to examine: and we see the atoms of oxygen and hydrogen arranging themselves to make six-sided figures which, when multiplied enormously, make the crystals of snow and ice with which we are familiar."

Science News-Letter, May 31, 1930

Statistics Aid Study of Insanity

Psychiatry

THE real nature of insanity is at last being probed with twentieth century mathematical precision. Discovery of eight fundamental factors in mental diseases is reported by Prof. Thomas V. Moore, psychiatrist of the Catholic University of America, who has combined his knowledge of mankind's mental failure with a skill in handling involved mathematical procedures.

In treating physical diseases, doctors long ago realized that a local pain or strange feeling meant some specific physical abnormality, Prof. Moore explained, in describing the progress of his elaborate research. From centuries of studying living patients and from autopsies, doctors now know the symptoms that point to hundreds of bodily diseases.

But the patient who is troubled with delusions of his own grandeur or who has fallen into a state of hopeless apathy may have no physical diseased condition that can be traced. And so, psychiatry has been slow to sort out the symptoms that fit together to make pictures of the different mental diseases. Doctors of mental disease talk in terms so vague that it is as if a physician should be satisfied to conclude simply that his patient had heart trouble.

To measure and chart the symptoms pointing to fundamental mental disorders, Prof. Moore has resorted to exact statistical procedures. He has determined the existence of 41 different symptoms, and eight syndromes or fundamental factors. As an example of one of the fundamental factors underlying mental illness, he mentioned defect of intellectual power. Another is constitutional hereditary depression, which attacks the controlling mechanism of emotional life but leaves the thinking process untouched.

The investigation is practically the first attempt to apply to mental diseases the statistical procedures so widely made use of by psychologists in studying normal people.

Science News-Letter, May 31, 1930

Sick Cells

WATCHING the progress of a plant disease inside a cell still attached to a living leaf is the accomplishment reported to the scientific journal *Nature* by two British plant pathologists, F. M. L. Sheffield and J. Henderson Smith, of the great English agricultural experiment station at Rothamsted.

For some time, the occurrence of peculiar structures known as X-bodies has been known in cells of plants sick with mosaic or other virus diseases. Under the microscope they look like independent masses of protoplasm, moving about within the cell, putting out extensions or processes, and in general suggesting the behavior of the primitive animals known as amebae. For this reason it has been suggested that they are actually alive, and possibly a phase of the disease-causing organism.

In their researches, Mr. Sheffield and Mr. Smith have inoculated leaves of a plant with the disease, and then watched the progress of events in the transparent, stiff, hair-like cells that stand out from its edge. At first nothing is noticeable. Then tiny particles appear in the cell protoplasm, and are carried round the cell by its streaming motion. The smaller particles unite into larger ones, and these finally into the relatively big masses known as the X-bodies. This "growth" is reversible, however, for the masses may break up into smaller particles again and these once more reunite.

The two investigators have not been able to convince themselves that the X-particles are alive. Various chemical tests indicated rather that they are products of protoplasmic changes tending towards death in the cell.

Plant Pathology

Science News-Letter, May 31, 1930

Hydraulic Laboratory

PRESIDENT Hoover has signed the bill authorizing the construction of a $350,000 National Hydraulic Laboratory at the U. S. Bureau of Standards.

Funds will probably be made available by Congress for use July 1 so the laboratory can be completed and its work begun during the coming year. Plans being prepared under the direction of H. N. Eaton of the Bureau of Standards staff are expected to be completed next fall.

Enough projects to keep the laboratory busy for a long time are ready to be submitted by the U. S. Reclamation Bureau, the Bureau of Public Roads and the Geological Survey. The laboratory will doubtless be completed in time to conduct some tests for Boulder Dam and the Chief of Engineers of the U. S. Army may request experiments in connection with Mississippi flood control. It is intended primarily for fundamental studies in hydraulics.

The erection of the laboratory comes as an indirect result of the efforts of a well-known hydraulic engineer, John R. Freeman, to make research in river hydraulics in this country comparable with that in Europe.

Surprised at advances abroad in the solution of river problems by model tests and anxious to bring this information to America and establish these methods in this country, Mr. Freeman provided scholarships to enable young American hydraulic engineers to study in Europe. These returning students and a book by Mr. Freeman describing European laboratories and methods, have largely caused the adoption of more modern practices and the establishing of up-to-date laboratories in this country.

Hydraulic Engineering

Science News-Letter, May 31, 1930

Preventive

CANNED salmon contains the substance which will prevent the frightful hard-times disease, pellagra, the U. S. Public Health Service has just announced. Canned salmon may therefore be substituted for meat in localities where pellagra is prevalent but where meat is scarce.

Hygiene

Science News-Letter, May 31, 1930

Social Doctors

SOCIAL doctors and social engineers, who are trying to help communities to overcome unemployment, delinquency and other troubles and assisting them to become healthier and more progressive, are to assemble for a National Conference of Social Work in Boston, June 8 to 14. Five thousand delegates, representing every state, as well as Canada and some European countries, will attend the national forum.

The unemployment problem will be given special consideration, speakers reporting on what employers are doing about it, what communities are doing, and what labor and the schools are doing. Old age as an economic problem will also be discussed. Other topics include prison tendencies in the United States, social aspects of immigration, family problems which may become social problems such as credit and installment buying, progress in tuberculosis control.

The social welfare of the Indians will be discussed at two special meetings.

More than forty organizations representing different types of social welfare work are to hold meetings during the conference period. These include such groups as the American Red Cross, the Family Welfare Association of America, the National Association of Travelers' Aid Societies, the National Community Center Association, the Salvation Army, National Federation of Day Nurseries, the Federal Council of Churches of Christ in America, and the National Tuberculosis Association.

Sociology

Science News-Letter, May 31, 1930

IN VARIOUS SIE

Smokeless City

COAL, the source of world power, illuminating gas, and vivid dyes, is going to yield still more of its black secrets, it can be announced with positive confidence. For during the next five years a combined research attack is to be made on it at the Carnegie Institute of Technology.

"There is no laboratory at present in the United States doing the work we have outlined," says Dr. Thomas S. Baker, president of the Institute. "There are many uses and by-products of coal still to be developed. Finally, there is the question of the smokeless city which can never be answered until a serviceable smokeless fuel has been discovered."

The research will cost $425,000 and is being financed by the Buhl Foundation of Pittsburgh and six great American industrial concerns.

Technology

Science News-Letter, May 31, 1930

800 *Mound Burials*

DIGGING into the cluster of 54 mounds which rise above the flat plain of the Warrior River, Dr. Walter Jones, state geologist of Alabama, has encountered 800 prehistoric graves.

The skeletons are accompanied by household and personal articles such as were used by mound building Indians, who farmed the fertile valleys

SIENCE FIELDS

of the Mississippi before the arrival of white pioneers. Stone pipes weighing several pounds are among the most curious possessions found by Dr. Jones. Bowls shaped in effigy of humans, and of fishes, frogs, and ducks are other objects of exceptional interest. Shells and beads lie near the wrists and ankles of the skeletons, and jars for food and water still remain near the skulls.

Among the articles that show the kind of lives led by these Alabama mound builders are awls or drills suitable for leather-work, paint pots, bowls of shell, ceremonial pipes, bones of turkey, deer, and fish, and weapons, chiefly stone axes, arrow heads, and stone breast plates with rattlesnakes depicted on them.

Haphazard digging at this site of prehistoric life and death has been stopped by the state government which is now directing all excavations.

Archaeology

Science News-Letter, May 31, 1930

Not Poison

METHYL chloride, the refrigerator gas held responsible for a number of poisonings during past months, is not likely to poison food or beverages if it leaks into the interior of a refrigerator. This is indicated by tests conducted at the U. S. Bureau of Mines laboratory at Pittsburgh, just announced by the U. S. Public Health Service. The scientists conducting the research were W. P. Yant, chemist, H. W. Shoaf, toxicologist, and J. Chornyak, medical officer. The tests were made at the request of one of the firms manufacturing methyl chloride.

Deliberate efforts were made to render food poisonous by exposing it to the gas in full concentration for many hours, and to poison the water by bubbling the gas directly through it—conditions which would never occur in any but the worst kind of internal leaks. Various kinds of food thus treated were fed to experimental animals, but these showed no ill effects.

Because water would absorb more methyl chloride than food would, a longer test was conducted with it. Water containing the gas nearly to the point of saturation was given to a group of experimental animals for a period of nearly six months, and although they sometimes showed signs of not liking the taste of it, they remained in apparent good health throughout the period. Only after they were killed at the end of the experimental period and their remains examined microscopically were any effects noted. It was discovered then that their kidneys showed some signs of strain from their long and severe service on the "poison squad."

Toxicology

Science News-Letter, May 31, 1930

Lepers Cleansed

THE release of eight persons who have been cured of leprosy at the National Leprosarium in Carville, La. has been announced by the U. S. Public Health Service.

To the eight who have been released this means the resumption of normal life with their fellow men.

To the scientists of the U. S. Public Health Service, the apparent cure of these eight, in addition to some 60 others released within the last eight years, represents further proof of the efficacy of the treatment with chaulmoogra oil as it is now carried out at the National Leprosarium, which is under the direction of the U. S. Public Health Service.

The eight just released included five men and three women. They had been at the leprosarium from two to eight years, coming from Minnesota, New York, Louisiana, California, Texas and Arkansas.

Medicine

Science News-Letter, May 31, 1930

Share Burrows

A PARALLEL for the old American tale about owls and rattlesnakes living in the same burrow has been found in New Zealand. Only the rattlesnake-owl story is now doubted by naturalists, while the new find is attested to as genuine by a correspondent in the British scientific weekly, *Nature*.

On eight or ten groups of islets near East Cape, North Island, N. Z., there are numerous tuataras, a strange lizard native to these islands. The same islets are inhabited by colonies of petrels, who nest in burrows in the ground. In many cases the burrows of the petrels are shared by tuataras during the nesting season, while in winter, after old and young petrels have departed for the north, the lizards hibernate in the burrows. Both petrels and lizards sleep during the day, departing at dusk to seek food. While a lizard may occasionally devour the solitary chick of the petrel, in general he lets it alone.

Zoology

Science News-Letter, May 31, 1930

Long Life

IF your parents lived a long time, you have a better chance of reaching a ripe old age than your fellowmen, Dr. Louis I. Dublin, statistician of the Metropolitan Life Insurance Co., reported at the meeting of the Eugenics Research Association.

Heredity as well as environment affects the length of a man's life. The longevity records of over 70,000 white men were followed in Dr. Dublin's study from the date of their insurance at the beginning of the century to 1928.

The men were divided into two groups: those whose parents died before 50 years and those whose parents were living after 50. There were fewer deaths in the second group than in the first. Members of the second group moreover could expect to live on the average two and a half years longer than members of the first group.

These results were confirmed by studies made of records of 34 American and Canadian life insurance companies between the years 1869 and 1900.

Physiology

Science News-Letter, May 31, 1930

Gas Pneumonia

EXPERIMENTING, boylike, with rubber tube and the gasoline tank of an automobile, an eight-year old lad got an unexpected dry cleaning of his lungs, which resulted in pneumonia, when his companion blew on the other end of the tube. The case was recently reported to the American Medical Association, Chicago.

When the other end of the tube was blown into, the gasoline was forced into the boy's mouth. He choked and had a severe strangling spell, from which he recovered, but pneumonia developed. For four weeks he could taste gasoline and it could be smelled on his breath.

Gasoline is rapidly absorbed by the lung tissue, the report stated. The pneumonia that follows this absorption is not typical. The fever is not high and the rapid breathing continues for a long period. The inflammation of the lungs does not remain in one spot, but wanders about, suggesting that the gasoline fumes also wander about in the lung tissue, setting up inflammation in other spots.

Medicine

Science News-Letter, May 31, 1930

How To Run A Machine Shop — A Classic Of Industry

Mechanics

ON THE ART OF CUTTING METALS, by Fred. W. Taylor. An address made at the opening of the annual meeting in New York, December, 1906. Published by the American Society of Mechanical Engineers.

In the early years of this century the ancient battle-ground of capital and labor was being invaded by a new protagonist, which was primarily interested neither in the profits of capital nor the privileges of labor, but in the best method of doing the job in hand. One of the more spectacular leaders in this movement was F. W. Taylor, whose ideas on wage scales appeared as a "Classic" in the Science News-Letter of March 29. Those ideas were worked out in connection with the researches on metal-working tools from which the following quotation is taken. Another by-product of this highly courageous tackling of a very complicated problem was the invention of vanadium tool steel.

THE experiments described in this paper were undertaken to obtain a part of the information necessary to establish in a machine shop our system of management, the central idea of which is:

2 (A). To give each workman each day in advance a definite task, with detailed written instructions, and an exact time allowance for each element of the work.

3 (B). To pay extraordinarily high wages to those who perform their tasks in the allotted time, and ordinary wages to those who take more than their time allowance.

4. There are three questions which must be answered each day in every machine shop by every machinist who is running a metal-cutting machine, such as a lathe, planer, drill press, milling machine, etc., namely:

a. WHAT TOOL SHALL I USE?
b. WHAT CUTTING SPEED SHALL I USE?
c. WHAT FEED SHALL I USE?

5. Our investigations, which were started 26 years ago with the definite purpose of finding the true answer to these questions under all the varying conditions of machine shop practice have been carried on up to the present time with this as the main object still in view.

6. The writer will confine himself almost exclusively to an attempted solution of this problem as it affects "roughing work"; *i. e.*, the preparation of the forgings or casting for the final finishing cut, which is taken only in those cases where great accuracy or high finish is called for. Fine finishing cuts will not be dealt with. Our principal object will be to describe the fundamental laws and principles which will enable us to do "roughing work" in the shortest time, whether the cuts are light or heavy, whether the work is rigid or elastic, and whether the machine tools are light and of small driving power or heavy and rigid with ample driving power.

7. In other words, our problem is to take the work and machines as we find them in a machine shop, and by properly changing the counter-shaft speeds, equipping the shop with tools of the best quality and shapes, and then making a slide rule for each machine to enable an intelligent mechanic with the aid of these slide rules to tell each workman how to do each piece of work in the quickest time.

8. It is to be distinctly understood that this is not a vague, Utopian result, to be hoped for in the future, but that it is an accomplished fact, and has been the daily practice in our machine shops for several years; and that the three great questions, as to shape of tools, speed, and feed, above referred to, are daily answered for all of the men in each shop far better by our one trained mechanic with the aid of his slide rule than they were formerly by the many machinists, each one of whom ran his own machine, etc., to suit his foreman or himself.

9. It may seem strange to say that a slide rule enables a good mechanic to double the output of a machine which has been run, for example, for ten years by a first-class machinist having exceptional knowledge of and experience with his machine, and who has been using his best judgment. Yet, our observation shows that, on the average, this understates the fact.

10. To make the reason for this more clear it should be understood that the man with the aid of his slide rule is called upon to determine the effect which each of the twelve elements or variables given below has upon the choice of cutting speed and feed; and it will be evident that the mechanic, expert or mathematician does not live who, without the aid of a slide rule or its equivalent, can hold in his head these twelve variables and measure their joint effect upon the problem.

11. These twelve elements or variables are as follows:

a. the quality of the metal which is to be cut;
b. the diameter of the work;
c. the depth of the cut;
d. the thickness of the shaving;
e. the elasticity of the work and of the tool;
f. the shape or contour of the cutting edge of the tool, together with its clearance and lip angles;
g. the chemical composition of the steel from which the tool is made, and the heat treatment of the tool;
h. whether a copious stream of water, or other cooling medium, is used on the tool;
j. the duration of the cut; *i. e.*, the time which a tool must last under pressure of the shaving without being reground;
k. the pressure of the chip or shaving upon the tool;
l. the changes of speed and feed possible in the lathe;
m. the pulling and feeding power of the lathe.

12. Broadly speaking, the problem of studying the effect of each of the above variables upon the cutting speed and of making this study practically useful, may be divided into four sections as follows:

13 (A). The determination by a series of experiments of the important facts or laws connected with the art of cutting metals.

14 (B). The finding of mathematical expressions for these laws which are so simple as to be suited to daily use.

15 (C). The investigation of the limitations and possibilities of metal cutting machines.

16 (D). The development of an instrument (a slide rule) which embodies, on the one hand, the laws of cutting metals, and on the other, the possibilities and limitations of the particular lathe or planer, etc., to which

it applies and which can be used by a machinist without mathematical training to quickly indicate in each case the speed and feed which will do the work quickest and best.

WHILE many of the results of these experiments are both interesting and valuable, we regard as of by far the greatest value that portion of our experiments and of our mathematical work which has resulted in the development of the slide rules; *i. e.*, the patient investigation and mathematical expression of the exact effect upon the cutting speed of such elements as the shape of the cutting edge of the tool, the thickness of the shaving, the depth of the cut, the quality of the metal being cut and the duration of the cut, etc. This work enables us to fix a daily task with a definite time allowance for each workman who is running a machine tool, and to pay the men a bonus for rapid work.

52. The gain from these slide rules is far greater than that of all the other improvements combined, because it accomplishes the original object, for which in 1880 the experiments were started; *i. e.*, that of taking the control of the machine shop out of the hands of the many workmen, and placing it completely in the hands of the management, thus superseding "rule of thumb" by scientific control.

53. By far the most difficult and illusive portion of this work has been the mathematical side: first, finding simple formulæ which expressed with approximate accuracy the effect of each of the numerous variables upon the cutting speed; and, second, finding a rapid method of using these formulæ in the solution of the daily machine shop problems. Several times during the progress of this mathematical work, the writer, feeling himself completely baffled, has asked the expert assistance of some of the best mathematicians in the country. They all smiled when told that we expected to solve mathematically a problem containing *twelve variables*, and in each case, after keeping the formulæ before them for a longer or shorter time, returned the problem to the writer with the statement that it belonged distinctly in the realm of "rule of thumb" or empiricism, and could be solved only by the slow method of trial and error.

54. In the investigation of an art such as that of cutting metals, and about which at the time our work was started there was so little scientific knowledge, two types of experiments are possible.

55. First, the thoroughly scientific type, in which, after an analysis of all the variable elements which affect the final result, an attempt is made to hold all of the elements constant and uniform, except the one variable which is under investigation, and this one is systematically changed and its effect upon the problem carefully noted.

56. It is to this type that our experiments belong, thanks mainly to the fact that Mr. William Sellers (one of the most scientific experimenters of his day) was president of the Midvale Steel Company when the writer started his work.

57. Second, the type of experiments in which the effect of two or more variables upon the problem is investigated at the same time and in the same experiment.

58. This method is of course much quicker than the thoroughly scientific type, and it is largely for this reason, in the opinion of the writer, that almost all of the other experimenters in this field have chosen it. Several of the experiments of this type have proved most valuable and developed much useful information, and it is with hesitancy that the writer criticises the work of any of these experimenters, since he appreciates most keenly the difficulties under which they worked, and is grateful for the information contributed by them to the art. After much consideration, however, he has decided to point out what he believes to be a few errors made by these experimenters, with the same object which he has in indicating our own false steps: namely, that of warning future investigators against similar errors.

Views of a tool before and after ruining by Taylor investigations. The author states that this drastic measure was adopted because other standards of use "resulted in the impossibility of accurately reduplicating the results obtained. And this after all remains the best gage of the value of experimental methods.... In all cases the earlier standards adopted by us required very close observation and judgment on the part of the experimenter to determine when the tool had reached that state of deterioration which was appropriate to its highest cutting speed. The advantage of our present standard, namely, that of completely ruining the tool, lies in the fact that it is an unmistakable, clear-cut phenomenon which calls for a minimum of judgment on the part of the operator, and thus eliminates one of the sources of human error in the experiments, and enables us to reduplicate our results with accuracy."

In the illustration are shown several views of a tool which has been completely ruined according to this standard.

59. Almost the whole course of our experiments is marked by imperfections in our methods, which, as we have realized them, have led us to go again more carefully over the ground previously traveled. These errors may be divided into three principal classes:

60 (A). The adoption of wrong or inadequate standards for measuring the effect of each of the variables upon the cutting speed.

61 (B). Failure on our part from various causes to hold all of the variables constant except the one which was being systematically changed in order to study the effect of these changes upon the cutting speed.

62 (C). The omission either through oversight or carelessness on our part of some one of the precautions which should be taken to insure accuracy, or failure to record some of the phenomena considered unimportant at the time, but which afterward proved to be essential to a complete understanding of the facts. . . .

64. The effect of each variable upon the problem is best determined by finding the exact rate of cutting speed (say, in feet per minute) which shall cause the tool to be completely ruined after having been run for 20 minutes under uniform conditions.

65. For example, if we wish to investigate the effect which a change in the thickness of the feed has upon the cutting speed, it is necessary to make a number of tools which are in all respects uniform, as to the exact shape or their cutting edge, their clearance and lip angles, their chemical composition and their heat treatment. These tools must then be run one after another, each for a period of 20 minutes, throughout which time the cutting speed is (*Turn to page* 351)

NATURE RAMBLINGS

By Frank Thone

Wild Rose

IF you like MacDowell's music, you surely like his "To a Wild Rose"—unless over-repetition by the radio has dulled you with a surfeit. But that gentle, graceful, informal rambling air, like a poem of Whitman's written on a staff, really does express the kind of a thing that the wild rose is. There is an evenness, a regularity, in its five-petaled flower, in its balanced compound leaves; there is an unevenness, an irregularity, in its loosely branching, often sprawling bush. It is a half-tamed gypsy, or a demure cottage girl playing truant for the nonce, as you prefer. It is not domestic enough for a garden, not rough enough for the real wilderness.

There are many species of wild rose, of many diverse habits and habitats, forming a great garland round the north temperate zone during the months of May and early June. Most of them have the orthodox, five-petaled flower that is basic to the whole botanical order to which the rose has given its name. So faithful is the rose to this pattern that the great circular windows in the old-world cathedrals, with their radiating patterns of colored light, have long been known as "rose windows."

But some of the wild roses have ambitions. You will find specimens in almost every thicket that are increasing the number of their petals, until with a little more selection under the artificial care of man they might easily assume the beginnings of doubling. The encouragement of this doubling tendency, incipient in many wild rose species, has in the course of the ages given rise to the highly conventionalized but still beautiful flowers that fill our rose gardens, or empty our purses when we go into a florist's.

Science News-Letter, May 31, 1930

Blistering Gas Made From Corncobs

Chemistry

A BLISTERING compound, or vesicant, very similiar in its properties and action to the much-feared mustard gas of war-time fame, has been prepared from corncobs by Dr. Henry Gilman and A. P. Hewlett of Iowa State College. And, on the principle of curing the bite with a hair of the dog that bit you, it has also been shown that charcoal made from corncobs may find application as an absorbent in defensive gas-masks.

The full chemical title of the newly prepared blistering chemical is beta-chloroethyl-2-furfuryl-sulfide.

It was not prepared in the first place with any idea of using it in war. The two chemists were looking for something that would put an unerasable mark on the hide of a hog, to identify it during its path of sorrow through the packing plant, preparatory to its metamorphosis into hams and side-meat. It seems to be very satisfactory for this purpose. It does not raise blisters on the porcine rind as it does on human skin, but merely makes red marks that will remain unchanged for at least twelve hours before killing. None of the original compound remains on the marks, so that it is safe for packing house employes to handle the hogs.

And just as the corncob charcoal could find use in war, so also does it have a possible peace-time application, with these same hogs. Fed to swine, it improves their digestions, possibly by absorbing troublesome internal gases.

Dr. Gilman and his associates have been carrying on a long series of experiments to find new uses for all parts of the corn plant. In the course of their researches they have evolved a great variety of substances of possible commercial value, including drugs, perfumes, flavoring extracts and a compound sweeter than saccharin.

Science News-Letter, May 31, 1930

Anti-TB Inoculations Not Used Here

Medicine

THE Calmette-Guérin method of antituberculosis inoculation of new-born infants, which has recently resulted in a number of deaths in a German baby asylum, is not used in the United States. American physicians in general have not advocated the method as have Continental doctors. Those American physicians who have favored it have advised a period of trial on animals before using it for human infants.

The method was developed by Drs. A. Calmette and C. Guérin, of the Pasteur Institute, Paris. A kind of half-starved strain of tuberculosis germs from cattle is injected into the infants during the first few hours or days of life. The germs are supposed to have lost their disease-producing power but to have retained the faculty of producing immunity or resistance to the disease. The originators of the method claim that it gives the babies protection against tuberculosis to which they may later be exposed.

The method is claimed to be particularly suited for the protection of children, born of tuberculous parents who would be continuously exposed to the disease during the first year of life, before they have a chance to acquire any immunity or resistance to it.

The method has been used at various European centers and even in Indo-China. At Luebeck, Germany, the deaths of 17 infants following the inoculations are being investigated by health authorities. Well over 50,000 infants born into tuberculous households have been inoculated in France. The mortality among these children is very much less than among other French babies who do not receive the inoculations and who are exposed to the disease in their homes.

Prof. C.-E. A. Winslow of the Yale School of Public Health recently advised that the method be given a thorough trial of animal experimentation in this country. Dr. M. H. Soule of the hygienic laboratory of the University of Michigan was even more enthusiastic about the method after visiting Dr. Calmette's clinic in Paris.

Other American scientists, among them Dr. S. A. Petroff of the Trudeau Sanitorium, Trudeau, N. Y., and Dr. Ralph Mellon of the Western Pennsylvania Hospital, Pittsburgh, have warned against the method.

Science News-Letter, May 31, 1930

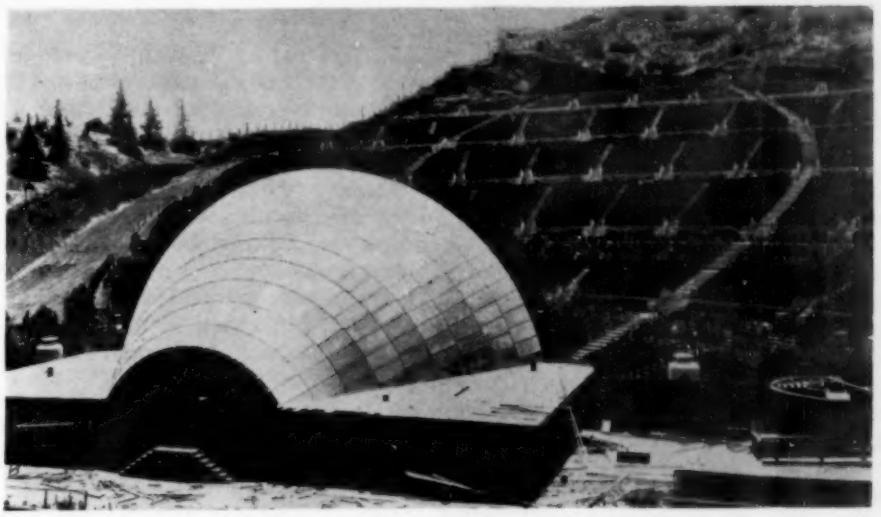
Those Farthest Away Can Hear the Best

Acoustics

New Sound Reflector Makes Pin Drop Audible

TWENTY-FIVE thousand people can now hear a pin drop in Hollywood Bowl.

In trying out the audibility of the new sound reflector on the Bowl stage engineers devised an even more delicate test than the proverbial pin drop. They let one number ten bird shot, which weighs slightly more than one one-thousandth of an ounce, fall eight inches on a kettledrum. The sound was heard in every part of the Bowl. Even when dropped only one-quarter inch, listeners in three-quarters of the Bowl distinctly heard the shot strike.



This reflector is the half shell of a huge cone, 45 feet high at the front of the stage and 18 feet high at the rear. It is made of 36 tons of structural steel and is padded inside and out with asbestos sheets. So carefully has it been designed that it directs more sound to those seated 550 feet away in the rear of the huge Bowl than to the occupants of "bald head row," because the close-up audience gets enough sound from direct waves. No electrical amplifiers are used.

The great reflecting cone is mounted on a portable stage, 105 feet wide and 45 feet deep, which is rolled aside 400 feet out of sight of the audience, when pageants are given. The cone was designed by Elliot, Bowen and Walz, consulting engineers of Los Angeles, Calif.

Science News-Letter, May 31, 1930

Interferometer Finds New Use

Plant Physiology

THE growth of plants can be seen with a new form of interferometer devised by Prof. K. W. Meissner of Frankfort, Germany.

The instrument is a modification of the interferometer invented by Prof. A. A. Michelson, of the University of Chicago, and used by him in his epoch-making experiments with light.

The interferometer is a device which permits the measurement of very tiny distances, far beyond the reach of the most powerful microscopes, by means of light-waves. A beam of light from a lamp is separated into two rays at a lightly silvered glass plate, and each of the two beams is reflected from a mirror, the two being reflected back to the plate, where they reunite and fall into an observing telescope. When two such beams are properly superposed, they are capable of "interfering," and we have the curious situation of light added to light giving darkness at certain points. For what one sees in the telescope is not a uniformly illuminated field, but a series of alternating bright and dark bands, or "interference fringes."

If, now, one of of the mirrors be slightly displaced, the fringe pattern moves to one side, and the distance it moves is a measure of the motion of the mirror. So sensitive is the method that it is readily possible to measure a displacement of the mirror of a millionth of an inch.

Prof. Meissner mounted the entire instrument vertically, thus bringing a whole new range of measurable phenomena within its scope. The movable mirror is carried by one arm of a trip-scales arrangement which permits a vertical motion of the mirror. The scales are very nearly balanced, and the mirror arm allowed to rest very lightly on the stem of the plant whose rate of growth is to be measured. As the plant grows, it pushes up the movable mirror, and the interference bands in the telescope are seen to wander across the field. Simply counting the number which pass a given mark in a certain time gives the rate of growth, which is of the order of one hundred-thousandth of an inch per second for most plants, so that a single line would move more than its own width in a second.

Ether fumes are wafted over the plant, almost immediately the growth ceases; a mercury lamp, rich in ultraviolet rays, is switched on, and the rate of growth increases many fold. It is such investigations as these which the botanist Prof. Laibach is carrying out with the new instrument.

Prof. Meissner, in demonstrating his device before the Congress of Physicists and Mathematicians in Prague, pointed out, among other uses of the instrument, the measurement of crystal growth and the analysis of musical tones and vibrations.

Science News-Letter, May 31, 1930

Rare Intisy Rubber Tree—*Continued*

long, thin, switch-like green-skinned branches all naked. The whole growth comes to resemble somewhat a gigantic inverted broom.

The intisy rubber tree is unique among all rubber-producing plants in that its milky sap, or latex, yields rubber of very high grade directly, without the troublesome dipping and smoking of the primitive Brazilian process, or the more modern chemical treatments used in the East Indies. All that the natives needed to do was cut a long gash in the rind of the tree and let the latex ooze out. When they came back the next day there would be a strip of pure rubber, in consistency almost like the rubber bands on your desk, lying stuck in the cut, and all they needed to do was take hold of one end and pull. They wound these long strips into balls and took them directly to market. It was the simplest from of rubber collecting that has ever been practiced.

But it was also the most destructive. In their eagerness to get the longest possible strips, the natives cut gashes spirally round every branch on every tree they could find, and this drastic girdling usually resulted in death after one "bleeding." The rubber production of the island, which had jumped to nearly a million pounds a year after the discovery of the intisy brush, dwindled again to almost nothing.

One thing that probably helped the persecuted plants that survived the massacre to carry on was the thoroughness of their adaptation to desert life. Real desert plants are usually organized to offer stubborn resistance to desperate environments, and the intisy is one of the best-organized desert plants known. Its leafless, switchlike stems, coated with wax, yield very little water to the demands of the arid air, and the gum that forms in every wound effectively stops bleeding of sap. Finally, intisy has one of the most efficient of water reservoirs, stowed safely underground, in its roots. Dr. Swingle states that no other plant has anything quite like it.

Each root is thickened in a series of sausage-like swellings, and practically the whole of the enlargement consists of water. The water is stored in swollen-up cells with which each "sausage" is filled. It is good water, too—the very slight "planty" taste did not deter Dr. Swingle and his party from slaking their thirst on these roots, in preference to the very poor drinking water usually obtainable at the desert water holes. He has given the structures the special name "hydriarhizas," which means "water-jug-roots."

It is these peculiar water-jug-roots which enable this plant to live in a country subjected yearly to a six-months drought, and where sometimes no rain falls for as many years.

Twenty of the original plants which Dr. Swingle dug in Madagascar survived the 10,000-mile trip, and thirty cuttings were rooted from these plants last summer. All of these original plants are growing, hence the total nursery stock now amounts to fifty specimens—possibly the most valuable lot of fifty plants now in America. Several of the water-filled roots which he also brought are still alive, but they have not put forth any shoots or leaves. Apparently the roots lose the power to produce stem-buds when they swell up and gorge themselves with water, if indeed the roots of this plant are capable of producing stems.

Most of the young plants are still growing in the greenhouses of the U. S. Department of Agriculture at Washington. They are being used for propagation, to increase the number of plants as rapidly as possible, and it is expected that several hundred rooted plants will be obtained during the present season.

However, a few have already been set outdoors, to test their possibilities. Two are at an experimental planting ground of the Department of Agriculture near Miami, Florida. This is a habitat with very much greater rainfall than the native home of the intisy; but it is always worth while giving a new plant a chance in a different setting, to see whether it may not possibly thrive better in a strange world than it did at home.

Two other plants have been set out near Yuma, Arizona, and two more on Torrey Pines Hill, near San Diego, California. The climatic conditions of our Southwest are very much like those of southern Madagascar, except that the winter temperature is not quite so high. It is therefore most probable that the new rubber tree will find its most congenial home on the wide plateaus south of the Colorado river and on the dry foothills and coastal country of California.

The one question still unsettled is whether the intisy can stand the light winters of this region. If it has even a little frost tolerance its range in the United States will be greatly extended. It is known that light frosts sometimes occur in part of the region where intisy naturally grows, but these are very light indeed and very seldom. Perhaps intisy will have to be entrusted to some of our neighbors to the south, such as Mexico, or the leeward side of Haiti, Porto Rico, Jamaica, etc. In either case, it will be comforting to have a rubber supply either on our own territory or on that of a friendly neighbor not separated from us by a wide sea that might under conceivable circumstances some day be closed to us.

There is no possibility of getting a hurry-up crop from intisy, such as Edison envisages as an emergency rubber supply from goldenrod. It is a higher-grade rubber plant than goldenrod, but a much slower grower.

Even if intisy proves adapted to American climate, and notwithstanding the extremely high quality of the rubber which it yields, it is quite possible that it might not prove commercially feasible for plantation methods of growing. If such proves to be the case, Dr. Swingle has suggested that a large acreage of this plant might be set out in the Southwest on tax-free land, leaving it to look out for itself until some day when it might be badly needed.

Science News-Letter, May 31, 1930

Diesel Engine—*Continued*

in the ordinary passenger car. Its cost and weight must be reduced and it must be made more flexible.

The Diesel has been used primarily in small stationary power plants, locomotives and ships. Its weight per horsepower has been many times that of the automobile engine and its speed constant and slow.

Research has accomplished much toward making an automobile power plant out of the original slow moving monster. In fact, several airplane engines have been developed, but their economies of weight cannot be applied to the automobile because they are radial type motors.

In high-speed Diesel engines, crude oil is injected into the cylinder just as it is needed for explosion. It is finely atomized as it enters through a minute hole under a pressure of thousands of pounds per square inch. Ignition is caused by the great heat of compression.

Science News-Letter, May 31, 1930

Energy—*Continued*

overcome, quinine can be used to cure the malaria. Instead of using disease to fight disease in the way that was usual before the usefulness of high frequency heating currents was discovered, paresis patients are now raised to high temperature by complex apparatus that consists essentially of a shortwave radio sending set.

Prof. McLennan's new contribution to this treatment is his discovery, made jointly with A. C. Burton, that the heating is dependent upon the conductivity of the material through which the high frequency current is pulsating. Physicians have been reluctant hitherto to utilize the new treatment because they could not be sure just how the patients would heat up. Now through the use of Prof. McLennan's results obtained from tests upon chemical solutions similar to those contained in living things, physicians will be able to tell just what frequencies or wavelengths of current to use to produce a fever in any given part of the body. For Prof. McLennan finds that to heat a material of given conductivity to the greatest degree there is one best frequency or wavelength.

Science News-Letter, May 31, 1930

Staff of Science Service—Acting Director, Vernon Kellogg; Managing Editor, Watson Davis; Staff Writers, Frank Thone, James Stokley, Emily C. Davis, Jane Stafford, Marjorie Van de Water, J. W. Young; Librarian, Minna Gill; Sales and Advertising Manager, Hallie Jenkins.

Board of Trustees of Science Service—*Honorary President*, William E. Ritter, University of California. Representing the American Association for the Advancement of Science, J. McKeen Cattell, *President*, Editor, Science, Garrison, N. Y.; Burton E. Livingston, The Johns Hopkins University, Baltimore, Md.; Raymond Pearl, Director, Institute for Biological Research, The Johns Hopkins University, Baltimore, Md. Representing the National Academy of Sciences, John C. Merriam, President, Carnegie Institute of Washington; R. A. Millikan, Director, Norman Bridge Laboratory of Physics, California Institute of Technology, Pasadena, California; David White, Senior Geologist, U. S. Geological Survey. Representing National Research Council, Vernon Kellogg, *Vice-President and Chairman of Executive Committee*, Permanent Secretary, National Research Council, Washington, D. C.; C. G. Abbot, Secretary, Smithsonian Institution, Washington, D. C.; Harrison E. Howe Editor of Industrial and Engineering Chemistry. Representing Journalistic Profession, John H. Finley, Associate Editor, New York Times; Mark Sullivan, Writer, Washington, D. C.; Marlen E. Pew, Editor of Editor and Publisher, New York City. Representing E. W. Scripps Estate, Harry L. Smithton, *Treasurer*, Cincinnati, Ohio; Robert P. Scripps, Scripps-Howard Newspapers, West-Chester, Ohio; Thomas L. Sidlo, Cleveland, Ohio.

How to Run a Machine Shop—*Continued*

maintained exactly uniform. Each tool should be run at a little faster cutting speed than its predecessor, until that cutting speed has been found which will cause the tool to be completely ruined at the end of 20 minutes....

66. A change is then made in the thickness of the shaving, and another set of 20-minute runs is made, with a series of similar uniform tools, until the cutting speed corresponding to the new thickness of feed has been determined; and by continuing in this way all of the cutting speeds are found which correspond to the various changes of feed. In the meantime, every precaution must be taken to maintain uniform all the other elements or variables which affect the cutting speed, such as the depth of the cut and the quality of the metal being cut; and the rate of the cutting speed must be frequently tested during each 20-minute run to be sure that it is uniform.

67. The cutting speeds corresponding to varying feeds are then plotted as points upon a curve, and a mathematical expression is found which represents the law of the effect of feed upon cutting speed. We believe that this standard or method of procedure constitutes the very foundation of successful investigation in this art; and it is from this standpoint that we propose to criticise both our own experiments and those made by other investigators.

68. It was only after about 14 years' work that we found that the best measure for the value of a tool lay in the exact cutting speed at which it was completely ruined at the end of 20 minutes. In the meantime, we had made one set of experiments after another as we successively found the errors due to our earlier standards, and realized and remedied the defects in our apparatus and methods; and we have now arrived at the interesting though rather humiliating conclusion that with our present knowledge of methods and apparatus, it would be entirely practicable to obtain through four or five years of experimenting all of the information which we have spent 26 years in getting.

Science News-Letter, May 31, 1930

FIRST GLANCES AT NEW BOOKS

A CENTURY OF EXPLORATION AT NINEVEH—R. Campbell Thompson and R. W. Hutchinson—*Luzac and Co., London,* 146 p., 7s 6d. This might be called the modern history of Nineveh. It is the record, not of a sequence of kings, but of archaeologists. Each during his "reign" at the mounds that represent the ruins of the city has restored some of the ancient life of Assyria's civilization. The record abounds in detail, which increases its value to the archaeologist. The non-specialist reader who has sufficient patience and interest in the subject to follow through so complete a story of a single site will be rewarded by feeling better acquainted with archaeological aims and procedures.

Archaeology

Science News-Letter, May 31, 1930

ANIMAL HABITS—C. E. Brown—*Philadelphia Zoological Garden,* 64 p., 25c. A most interesting booklet about the reptiles, birds and mammals of the Philadelphia Zoo, well illustrated with halftones of some of the more striking specimens.

Zoology

Science News-Letter, May 31, 1930

EVOLUTION—E. W. MacBride—*Cape and Smith,* 122 p., 60c. In this little book, Prof. MacBride most praiseworthily avoids the scientific dogmatism into which many other writers fall when they try to set forth the doctrine of evolution in brief compass for the layman. He presents such positive knowledge as we have in clear and understandable form, and frankly faces the lacunae. And at the end he tactfully bows the vexed question of the evolution of mind over to the philosopher and the psychologist—an example which might profitably be followed by other zoologists, unless they happen to be philosophers themselves.

Evolution

Science News-Letter, May 31, 1930

STUDIES OF COMMON FISHES OF THE MISSISSIPPI RIVER AT KEOKUK—R. E. Coker—*U. S. Bureau of Fisheries,* 225 p., 50c. The erection of the great Mississippi dam at Keokuk raised a number of problems for fisheries men, and in the course of the study of these a good deal of valuable information about the fishes of the great river was accumulated. This is incorporated into the present document and is now offered to the public.

Ichthyology

Science News-Letter, May 31, 1930

FOUNDATIONS OF MENTAL HEALTH—Leonardo Bianchi, translated by G. A. Barricelli—*Appleton,* 277 p., $2.50. One of Italy's best known psychiatrists, who died in 1927, put into this book his views on alcoholism, the penal system, sex education, religious education, and various mental hygiene subjects. In his vigorous, direct style he sets forth his aim: "I write . . . . to dislodge indifference to the momentous subject of eugenics, to lay open to the public conscience the dangers of bad habits and of certain defects of our present school system, to call attention to the responsibility of the Government, to fan the fires of the inexhaustible energies of our race which now lie sleeping under the ashes of inertness, of ignorance, and of old customs. I write for the invigoration of our spirits and for the discipline of our lives in health, in strength, in new religion, in beneficent liberty."

Mental Hygiene

Science News-Letter, May 31, 1930

BIG TREES—Walter Fry and J. R. White—*Stanford,* 114 p., $2. This is the story of the trees that, having marched around the world in the course of the ages, finally have made their last stand on the western slope of California's Sierra Nevada Range. The life history of the trees, based on many years' actual study on the ground, facts regarding their tremendous size, and what may be called their human history—the facts of their discovery, the long fight for their preservation from the lumber interests, etc.—all are presented in this volume. An interesting compilation contained in Big Trees is a list of the various groves of sequoias in California. Seventy-one groves in all are listed.

Dendrology

Science News-Letter, May 31, 1930

ELEMENTS OF ELECTRICITY—Anthony Zeleny—*McGraw-Hill,* 438 p., $3. Students who use Prof. Zeleny's text will be fortunate, since he has combined with the necessary textbook presentation much history, background and handbook data. One useful feature of the book is "A Note to The Student," which tells what the studeut must know before he can undertake the study of the textbook and how he may best expend his energy during his course.

Electricity

Science News-Letter, May 31, 1930

A TEXTBOOK OF ECONOMIC ZOOLOGY—Z. P. Metcalf—*Lea and Febiger,* 392 p., $4. A book for college students, giving the main facts from every angle about animals that materially affect our lives, whether as sources of food, clothing or industrial materials; as parasites within or upon ourselves or our domestic animals and plants; as predatories, poisoners, or pests. In addition to its direct use in courses on economic zoology, this book should be valuable as a side reference work in puttting more juice into general biology courses.

Zoology

Science News-Letter, May 31, 1930

ELECTROPLATING WITH CHROMIUM, COPPER AND NICKEL—Benjamin Freeman and Frederick G. Hoppe—*Prentice-Hall,* 202 p., $5. A manual meeting an insistent demand for information concerning the process of chromium plating, which has become increasingly popular since its commercial introduction about four years ago for furnishing a surface of extreme hardness and brilliant luster. Copper and nickel plating are also described because one must form a basis for chromium.

Chemistry

Science News-Letter, May 31, 1930

LIVE STOCK AND POULTRY DISEASES—W. A. Billings—*Macmillan,* 504 p., $3.50. Prof. Billings has done a very serviceable job in getting such a substantial mass of information and practical suggestion about the diseases of animals and their treatment into one solid volume. It will be useful as a text for the student of animal husbandry and veterinary medicine, and as a reference book for his shelves after he has graduated and gone to work.

Veterinary Medicine

Science News-Letter, May 31, 1930

THE EPIDEMIOLOGY AND CONTROL OF MALARIA IN PALESTINE—Israel J. Kligler—*University of Chicago Press,* 231 p., $5. This monograph by the director of the department of hygiene of the Hebrew University, Jerusalem, will be extremely interesting and valuable to epidemiologists. The book includes social, economic and historic aspects of malaria in a complete account of the situation in the Holy Land.

Public Health

Science News-Letter, May 31, 1930